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Lewis Swift

The Rochester Astronomer

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Rochester has had many nicknames and still cherishes such titles as Flower City, Kodak City, City of Homes, and others, not all as appropriate as in former times; but only an occasional old timer will remember that back in the 1880's it was sometimes called the Astronomical City. Lewis Swift coined the phrase—in more than one sense, for it was largely through his efforts that many Rochesterians developed an absorbing interest in astronomy. Comets, some with two or more tails, some with none, seemed to be hovering in the heavens over Rochester waiting for "Professor" Swift to spot them. The flat roof of Duffy's cider mill, where he mounted his telescope in the mid-seventies, became so widely celebrated that H. H. Warner, the local patent medicine king, endeavored to hitch his sales program to the tail of Comet Swift, only to lose his hold and his fortune as well in the depression of the mid-nineties. But Swift, the hardware merchant who became a Professor and a Ph.D. without matriculating in college, made a real contribution to the intellectual life of the city and likewise to the advancement of astronomy. An appraisal of his career has long been overdue.

Few men have captured the imagination of a community so suddenly as did Lewis Swift. Much of this success can be attributed to his subjects, for comets are flashing, mysterious bodies, and suddenly to find an authority on such matters, a wizard of the heavens, in their midst was quite a thrill to the 80,000 Rochesterians of 1874. A man who had perhaps bought a pump handle or a buggy whip from Swift's hardware store on State Street early that year could not escape a shock

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of surprise when he opened his *Democrat & Chronicle* on July 15 and read that the same Lewis Swift had just discovered a comet. Even Daniel W. Powers, banker and owner of the imposing Powers Block at the Four Corners, largest structure in Western New York, became excited and invited the astronomer to mount the telescope on top of his newly completed tower, highest point in the city.

It soon became known that Monsieur Coggia, an astronomer in Marseilles, France, had sighted the comet shortly before Swift, but the Rochester man was the first American to see it. Many curious neighbors wanted to have a look for themselves through Swift's homemade telescope, asking so many questions that he was persuaded to write a letter to the editor describing the celestial wanderer and comparing it with earlier comets. Swift's letter quickly revealed that he knew more about the subject than could be dug out of the Athenaeum library, although there were at least a half dozen astronomy books on its shelves.

The Coggia comet shortly passed beyond the city's horizon, but Lewis Swift had won the title of "Professor" from his admiring fellow citizens. For two decades, wherever he appeared about the city, talk of comets and stars was sure to follow. An eclipse of the moon, then an eclipse of the sun, and several more comets proved the heavens to be alive with excitement. Many residents took to star-gazing, and several of Swift's more assiduous disciples acquired telescopes, though the first discovery most of them made was that astronomy required not only time and patience but skill and knowledge as well.

Nor had Professor Swift become an astronomer over night, at the age of fifty-four, as the papers seemed to interpret his phenomenal rise. Long years had been spent in developing natural talents, in accumulating the information and learning the techniques essential to astronomical observation. The obscure details of the first and longer portion of his career are therefore as full of interest to the historian as the more dramatic events of his last thirty-nine years.

The Astronomer's Background

Born in the frontier settlement of Clarkson on February 29, 1820, a year before it became a part of the newly established County of Monroe, Lewis Swift shared the hardships that characterized pioneer life during the nation's first half-century. He likewise acquired the resourcefulness that so frequently develops in such environments. Fortunately he received from his parents a generous supply of native

talents and the courage to venture into unexplored fields. He grew up with the area, discovering and developing new aspects of his personality as the community about him matured and ripened. By the time Western New York was ready to hear and support an astronomer, Swift was ready to serve.

The bleak surroundings of Lewis Swift's birthplace should not obscure the heritage he received. Many of the pioneers were able folk, and his parents were no exception. His father, also named Lewis Swift, known to his neighbors as General Swift because of his rank in the militia, was in his turn the son of Rowland Swift who had served during the Revolution in General Putnam's personal guard. Rowland's brother, Zephaniah Swift, was an eminent jurist in Connecticut, a member of the state legislature, and served as secretary to Chief Justice Ellsworth during his mission to France. Other able relatives and progenitors added luster to a family tree that stemmed from William Swift who came from England to Massachusetts in 1630.

As a young man of twenty-five, Lewis Swift, Senior, migrated with his wife, Anna (Forbes), from Connecticut in 1809 to the northern wilds of what was then Genesee County. Amid typical frontier hardships, including frequent sieges of Genesee fever, a farm was cleared, a home was built just north of the ridge road, and the family prospered in a modest way, sufficiently to play a worthy role in the growth of the town of Clarkson. General Swift served as justice of the peace, was a pillar in the Congregational church, and helped to organize the Clarkson Library Company in 1822 and, a dozen years later, the Clarkson Academy. Possessed of mechanical ingenuity, he invented a horse hay rake which he manufactured with the aid of his sons in a small shop during the winter months. The rake won a first prize at the State Fair of 1843 in Rochester, and at Utica two years later. When the General died the next year at the age of sixty-two, both Rochester dailies carried an appreciation of his work.

Aside from this sketchy picture of a thriving pioneer family, little is known of the early life of Lewis Swift, the sixth among nine children, until, at the age of thirteen, an accident, in which he fractured his left hip, proved a blessing in disguise. The inadequate surgery of the day left him permanently lame. For several years he was unable to walk without crutches. Thus incapacitated for farm work, he gained time for study. At fifteen, in the year of Halley's famous comet, as he later

recalled, he joined the opening class of the small Clarkson Academy and with a dozen or so fellow scholars read and recited from such books as Daboll's arithmetic, Day's algebra, Comstock's chemistry, and Watt's intellectual philosophy. By the end of three years, when he had perhaps mastered all that the three academy instructors could offer, his injury had healed sufficiently to permit a return to work, and for several seasons he assisted his father on the farm. No doubt it was during these winters, when he labored with other members of the family in the rake factory, that he learned many of the skills which were to prove advantageous in later life.

We can imagine him, in these years of young manhood, before the death of his father compelled him to strike out on his own, poring over the small collection of books in the academy or those of the already moribund Clarkson Library Company. He may have made occasional journeys to Rochester, by stage along the Ridge Road, or by canal boat from the near-by town of Brockport. Indeed, the Flower City, where several former neighbors, the Clarkes and Seldens among others, were rising to positions of influence, must have seemed the center of opportunity. Lewis Swift apparently followed the interests of these older neighbors with close attention, for shortly after their first financial venture in the new field of the telegraph, the young man launched an independent venture of his own in the same field. Swift's scheme, however, was purely educational. After mastering the principles involved, the young practical scientist rigged up a device to demonstrate the wonders of magnetism and electricity, as employed in the telegraph, and set out to tour the West and Canada as an itinerant lecturer.

It was a good way to see the country, and it may have enabled Swift to work off some of the wanderlust bred in his bones, but the life of a traveling scientific showman began to pall after a time. Returning to New York state, he married Lucretia Hunt of Cortland County on June 26, 1850, and settled on his mother's farm in Clarkson. Farming, however, failed to satisfy his inquiring mind. Soon he was off on another lecture tour, this time as a microscopist, demonstrating the newly discovered wonders of the microscopic world with the aid of a special contraption of his own manufacture, which used a calcium light to throw an image of microscopic objects onto a screen.

No one could deny that young Mr. Swift was an ingenious fellow or that he was keeping abreast of the latest developments. Microscopy

was a new science, and Dr. Dewey had introduced the first instrument of the kind to Rochester only a few years before; the first stereopticon lecture reported in the Rochester papers did not occur until 1863; moreover, Dr. George Hand Smith, a relative and close friend of Henry R. Selden, Swift's neighbor in Clarkson, did not perfect and secure a patent on his calcium headlight for railroad engines until 1859. It would be hard to determine whether Swift anticipated or followed these developments, but certainly he had no financial interest in their promotion. Moreover, his wife, Lucretia, who bore him a son and daughter in these years, must have urged the necessity for their support as a compelling reason to settle down. Accordingly, in 1854, he opened a hardware store in the neighborhood of his wife's relatives in Cortland, some twenty miles south of Syracuse. Scientific interests would apparently have to be sacrificed.

Fortunately, business was none too brisk in that rather out-of-the-way location, allowing Swift much time to read. When a traveling book agent dropped by in 1855, he received an order for the complete works of Dr. Thomas Dick, a Scottish divine who had written several works on the microscope, the telescope and especially upon the celestial wonders to be seen with the latter's aid. It was a curious order to come from a hardware merchant, but not from Swift. The Athenaeum library in Rochester possessed four volumes by Dick at this time, and they could not have been unknown to a lecturer on microscopy.

The arrival of Dick's books proved the turning point in Swift's career. He had already explored the uses of the microscope, and his agile mind turned eagerly to the sections on the telescope. Perhaps his own vivid memory of the Halley comet, seen in his youth, spurred him on. He could not be content simply to read about telescopes and stars, he must study them. Following Dick's convenient directions, he made his own telescope, using a three-inch objective lens purchased secondhand for five dollars. When, after a time, that lens was accidentally broken, he replaced it with a 4½-inch lens ordered from Henry Fitz of New York, the leading telescope maker in the country. The instrument reached Cortland just in time for Swift to observe the flight of Donati's great comet of 1858, one of the brightest of the century. Swift was so excited by what he saw that he wrote a paper describing the comet in detail and sent it to the *Astronomical Journal* of Albany where it

appeared in November, 1858. He was determined to vindicate his interest in science by discovering the next comet himself.

It is important to note that Rochesterians were discussing astronomy at some length in these years. A course of scientific lectures delivered before the Athenaeum in 1857 by Dr. Ormsby Mitchel, the Cincinnati astronomer, was repeated by popular demand in 1858. The Cortland merchant may have visited Rochester to attend some of these lectures and he certainly must have received clippings describing them from his old friends in that region. But whether he knew of them or not, the Mitchel lectures belong in the pattern of Swift's career, for Rochesterians who heard them were being prepared for the day when an astronomer would arise in their own midst.

Swift labored patiently, for several years scanning the heavens in the region of the sun for an hour or so after dusk and again just before dawn. Finally, his efforts were rewarded when he was the first to sight the Great Comet of 1862, a periodic of 120 years. Soon it became visible to the naked eye, with its tail streaming through an arc of twenty-five degrees. The elements of its orbit seemed to agree exactly with the star shower of August tenth, prompting many old folks to recall the great shower of 1833 of which Swift had only a faint memory.

Although his astronomical studies must have suffered frequent interruptions, Swift would not give them up. Indeed in 1869 he made a trip to Mattoon, Illinois, taking his telescope to a location within the region of the total eclipse of that year where he made a special study of solar prominences and the corona. In 1871 he sighted another comet, only to learn that he had been anticipated in Europe.

Having lost his first wife in 1862, Lewis Swift married Caroline Topping of Long Island in August, 1864. The ties in Cortland were loosening, and with the added responsibilities brought by three more children, he decided to move to Rochester in 1872.

Professor Swift of Rochester

As the Flower City was enjoying an industrial boom in the decade following the war, the opportunities for an experienced hardware merchant appeared bright. Possibly Swift likewise considered the prospect of developing congenial scientific associations, for Rochester was already gaining a reputation in that respect. He could not have dreamed that within a decade, his own reputation as an astronomer would provide

not only time and facilities for research but support for himself and family as well.

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The new location presented unexpected difficulties at first. After a brief residence on Jones Street he moved his family to a modest house on Ambrose Street, far enough out from the central area to escape the glare of the gas lights. Yet that was likewise a settled neighborhood, and although the flickering oil lamps in near-by houses did not blur the vision of the telescope, mounted in his back yard, the mass of houses and trees made it difficult to scan the low horizon where comets first appear. He must have been too busy for a time to give close attention to astronomy, but a report in July, 1873, of a new comet sighted in Europe renewed his enthusiasm, and soon he was able to announce its location to interested neighbors.

It was a year later that the city finally awoke with a start to the presence in its midst of an able astronomer. The first announcement on July fifteenth of Swift's discovery of a new comet brought an invitation, as noted above, from Daniel W. Powers to make use of the Powers Block tower; when that lofty perch proved unsuitable, because of the glow from the streets below, former Congressman Lewis Selye offered the use of his spacious estate on an elevation known as Lake View Park, north of the city. There Swift mounted his telescope and enjoyed an unobstructed view of the Coggia comet for several nights. Many citizens drove out to watch the astronomer at work, perhaps to take a look through his telescope themselves. Even the fickle press continued for more than nine months to display an interest in the comet. The next March, at the close of a series of popular lectures on science given by Professor Lattimore of the university for the special benefit of working-men, Professor Swift was invited to give a lecture on "The Wonders of the Moon." Some months later he contributed an article on the planet Mars to the *Union & Advertiser* in which he attacked a contemporary theory that its inhabitants were attempting to send messages to the Earth.

Rochester's appreciation of its astronomer increased markedly in 1876. June brought an invitation from Bausch and Lomb, the rising optical firm, to inspect their first telescope, manufactured to fill an order from Aaron Erickson, the leading wool merchant of the area. In August, Professor Swift, who had meanwhile found a dark alley in which to

mount his telescope, announced the approach of a meteoric shower and requested the cooperation of other citizens in observing unusual details. His comments after the shower, which arrived as predicted, were respectfully noted. It was about this time that the Professor was invited to mount his telescope on the flat roof of the Duffy cider mill on White Street, a location (about half a mile from his home) which commanded a wide sweep of the horizon. The newspapers reported in December that "the celebrated local astronomer" had received a request from the Northwestern Lyceum Bureau to deliver a series of lectures on astronomy in various towns and cities.

The flat roof of the cider mill possessed many advantages, including a certain publicity value. Rochester never tired of reading about the still slightly lame Professor, who carried his eyepieces in a market basket and kept the rest of his telescope stored in a box on the roof near a post to which he fastened it when ready for work. Without protection from the elements he would sometimes spend the whole night lying on a rug spread under the telescope gazing at the stars. On clear evenings, when Swift was certain to be at his post, a reporter or an interested citizen might climb the three ladders leading to his airy loft with the assurance of learning something new, if not always something of news interest.

At least once a year during the late seventies the news was exciting: the Professor had discovered a comet! Checking himself on such occasions, Swift would study his object again to make sure there was no mistake; if satisfied, he would rush down the ladders and catch a horsecar into the city where a telegram could be dispatched to the Dudley observatory in Albany, later to the observatory in Vienna. The next hours were always impatient ones for Swift and his friends, awaiting confirmation of his discovery. Several times an earlier discovery was reported, but on six occasions between April 1877, and November 1881, the Rochester astronomer was judged the first to sight the new comet, which then became known as the Swift comet of 1877, 1878, 1879, 1880 or 1881. The final confirmation for the discovery of the first three of these comets came in the form of gold medals issued by the Imperial Academy of Science in Vienna. By 1881, Swift had himself become the final judge as to the identity of the first American discoverer of each new comet.

Thrilling as was the discovery of a new comet to the astronomer and his friends, many other developments were crowded into these years. Requests for lectures were not infrequent. In April, 1878, he

addressed a packed house at Corinthian Hall on the "Marvels of Astronomy." A major feature of that lecture was his report on recent observations made of the transit of Mercury across the face of the sun. He had been assisted in that study by William Rebasz, a watch maker who now emerged as an able student of astronomy. Swift won another close friend and disciple that year, Henry C. Maine, a reporter for the *Democrat*, whose keen interest, like that of Rebasz, soon resulted in the mounting of additional telescopes in Rochester.

The big event in the astronomical world of 1878 was the total eclipse of the sun. Astronomers throughout the country planned for months in advance to transport their telescopes to advantageous points of observation within the area of total eclipse. Professor Swift, with the backing of several local friends, journeyed to Denver, Colorado, for the occasion. On the way he visited the great 18½-inch telescope at Dearborn, near Chicago. There he was joined by a group of Princeton astronomers who were taking their 9½-inch telescope west, likewise to Colorado. At Denver several Rochester men, who had recently migrated to that town, assisted Professor Swift in the task of mounting the 4½-inch telescope and in the observations that followed.

It was in the short period of intense excitement during this eclipse that Swift made a "discovery" which in later years seriously jeopardized his reputation as an astronomer. At the time, however, it added much to his fame, at least in popular eyes. Great excitement followed the announcement that he had discovered, in the brief period of total eclipse, two small objects, one of which he identified as the planet Vulcan which the mathematical calculations of the astronomer Leverrier had placed between Mercury and the sun. Professor Watson of the University of Michigan likewise announced a similar discovery, but he had delayed his releases in order to check the literature, and Swift received the credit. Papers throughout the country joyfully reported the new American contribution to astronomy. On his return to Rochester, the Professor gave a free lecture to a large audience at the Opera House. Local enthusiasts launched a campaign to raise funds for a proper observatory to facilitate the astronomer's work.

Years passed before the doubts of sober astronomers concerning the discovery of Vulcan were finally verified. Swift's empirical evidence was difficult to refute, especially in view of Watson's apparent confirmation and the occasional announcements by other astronomers of a similar

discovery. The current mathematical theory of the movements of the solar system seemed to require the presence of such a planet, and it was not until much later, when a new mathematician, Albert Einstein, corrected the solar system's time clock, that the existence of Vulcan was ruled out theoretically. The failure of more skilled and better equipped researchers in recent decades to find such a planet has finally shelved Swift's "discovery" as an error in observation.

Fortunately, Swift's reputation was well established before this correction was made. In Rochester, his error concerning Vulcan failed to arouse as great a stir as his mistake in another matter. Baseball fans were talking excitedly in the late seventies about a pitcher who had hurled curved balls in a game at Rochester. A reporter, seeking scientific support or denial, approached Professor Swift, who declared categorically that it was only an optical illusion. Ball fans were not content with the decision, however, and after persuading the Professor to witness a demonstration next to a brick wall, secured a reversal of judgment. The Professor could be mistaken, and could change his mind, both of which discoveries endeared him still more to the average citizen.

Academic and professional honors were numerous in these years. He was elected a Fellow of the Royal Astronomical Society in 1879, the same year in which the University of Rochester gave him an honorary Ph.D. Sharing the platform on the latter occasion was Dean Francis Wayland of the Yale Law School who received an L.L.D. Dr. Swift, as professional men now addressed him (though to the public he was still the Professor), became a fellow of the American Association for the Advancement of Science and in 1881 received the Lalande prize, a silver medal and 540 francs, from the Institute of France in recognition of his many discoveries.

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The campaign for an observatory encountered numerous difficulties. Other worthy causes appeared to have priority: the university and theological seminary needed funds, not to mention the hospitals and the baseball club; the Athenaeum was closed for want of a patron; Daniel W. Powers was committed to his art gallery. Yet the newspapers were most friendly, and when Swift's first benefactor, Lewis Brooks, died before he had an opportunity to make good his promise of \$1000 for a new and better telescope, the papers were soon able to report that

the three principal heirs had each agreed to give \$1000. The campaign made sufficient headway to justify consultation with an architect. The plans at this time called for a telescope equipped with a seven-inch refractor, similar to that of Dr. Mitchel in Cincinnati. It was estimated that a cottage and observatory would cost \$6,000, exclusive of the telescope, which would require another \$1,500.

Approximately half of that fund had been raised when, early in 1879, a dynamic figure entered the picture. Suddenly, in February, it was announced that a well known citizen had offered to build a more substantial observatory at a cost of \$20,000 provided the city would raise its sights and aim toward a fund for a 16-inch refractor telescope, estimated to cost about \$12,000, but certain to place Rochester in the forefront of astronomical cities.

Tradition tells of a chance meeting between Swift and Hulbert Harrington Warner during which the latter was greatly impressed with the gold medal the Professor had just received from Vienna. Warner was a vigorous business man of the new promotional type. He had been remarkably successful as a distributor of iron safes, and had just recently launched upon a new venture, the manufacture and sale of Warner's Safe Liver Pills. Moreover, he was building a pretentious mansion on East Avenue, much the most costly yet erected in Rochester, which was described at its completion late that year as "a piece of frozen music." Its unexpected "turrets, battlemented gables, porticos and jutting windows presented new surprises and beauties from almost every point of view, within and without." No house in Rochester could rival it.

Warner had come to Rochester in 1870, two years ahead of Swift, but he had been too busy promoting his varied enterprises throughout the country to give much thought to the community. His expanding business prospects and now the new scale of his domestic arrangements prompted him to take a larger interest in civic affairs. Hiram Sibley was a patron of the university; Daniel W. Powers had his art gallery; Mortimer F. Reynolds was rumored to be planning the establishment of a library; Asa T. Soule was the angel of various sports. Warner decided to build an observatory provided Swift could raise enough in the city to buy the kind of telescope that would make the venture worth while

Warner's vigor stirred an enthusiastic response. Soon the subscription list showed practically enough to cover the cost of the telescope.

Swift placed an order with Alvan Clark and Son of Cambridge, by this date the leading telescope makers in the country. Glass was ordered for the purpose from Birmingham, and when the first piece developed defects in grinding, a second was ordered, for Alvan Clark took a special pride in the perfection of his lenses. With the telescope assured, Warner announced the purchase of a lot at the corner of East Avenue and Arnold Park, not far from his own mansion. A reporter soon learned that the earlier plans for a modest home and observatory had been revised to give the Professor a stone residence of generous proportions, with a circular tower supporting an observatory dome some sixty feet above the ground.

Many factors influenced the expansion of Warner's plans. The Professor had originally voiced modest requirements, but on his journeys to Boston to order the lens and later to attend a meeting of the American Association for the Advancement of Science, Swift visited several observatories where he gained a fuller appreciation of the problems involved. Back in Rochester, he renewed his labors on the roof of the Duffy cider mill, more conscious than before of the difficulty of distinguishing between comets and nebulae. An effort to prepare a suitable chart of known nebulae disclosed the need for an astronomical library, while the program for continued observation which he now contemplated required the installation of a spectroscope, a sidereal clock, and other apparatus.

H. H. Warner, whose patent medicine business was prospering beyond all expectations, had no intention of establishing a second-rate observatory. He determined to make it a vital institution, devoted not only to research, but to popular education as well. The Professor should have a luxurious home and ample maintenance, so that his full time could be devoted to the work. An elevator was required, outside the tower to avoid any vibration of the instruments, but arranged so that visitors could be lifted to the floor of the rotunda with ease. The dome had to be mounted so that it could be rotated with little effort, for Swift was advancing in years. These and other details had to be worked out with care, occasioning many delays and increasing the cost.

A new function was assumed in 1881 when Warner learned that the Vienna observatory had been compelled to discontinue its award of gold medals to the first discoverer of new comets. The patent medicine king, now reputed to be supreme in all America, decided to assume that service

for his new observatory. A new award was announced of a gold medal and \$200 in cash for the first American discoverer of each new comet. Furthermore, if less than five were discovered in any one year, the Warner Safe Remedy Prizes, as they were called, were to be increased so that the total outlay equalled \$1000. Professor Swift was to be the judge of awards, and astronomers were invited to address their claims directly to him. Thus, even before the observatory was completed, Swift became an authority in this the most popular field of astronomical observation.

Although Swift's responsibilities at the hardware store continued throughout these years, an increasing share of his time was devoted to astronomy. Many of the technical details related to the new observatory required his attention, while his observations from the roof of the Duffy cider mill continued. A display of shooting stars called forth an article on "Celestial Fireworks" for the *Democrat*. *Leslie's Illustrated Weekly* published an account of the plans of Swift and Warner, featuring the architect's drawings of the new observatory. The Professor discovered three new comets and was called upon to verify the discoveries of others. In August, 1881, the appearance of a new comet, visible to the naked eye, brought a flood of 3,000 letters from observers throughout the country, each claiming the award. Swift quickly decided that it would be impossible to choose the winner from such an army of contestants, and Warner offered a substitute prize for the best essay on comets. The winning essay in that contest, together with three prize-winning articles in a later contest on "Red Light" which brought 36 essays from all parts of the world, appeared in Swift's small volume on *The History and Work of the Warner Observatory*.

The Warner Observatory

Finally in November, 1882, the observatory was ready for the installation of the telescope. Young Alvan G. Clark personally brought the instrument from Boston. It was a momentous occasion as the great telescope, 22 feet in length, equipped with a 16-inch objective lens, was safely mounted on its pedestal. Only the 26-inch lens of the Naval Observatory, the new 23-inch lens of the Princeton observatory, and the 18½-inch lens at Dearborn near Chicago exceeded the 2000 magnification power of the Swift telescope. Hiram Sibley had presented a

spectroscope, valued at \$1,000; Alonzo Watson had given a sidereal clock, while another clock as well as the telescope had been paid for by public subscription. The imposing observatory itself, with its massive stone tower, 31 feet in diameter, and the top of its dome 65 feet above the ground, had cost H. H. Warner nearly \$100,000. The papers proudly hailed him as the most generous patron of astronomy the world had yet produced.

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Fortunately, Professor Swift was able very shortly to satisfy popular expectation by discovering a new comet in February, 1883. This, however, was the last Swift comet for several years, for the astronomer now had a more important function to perform—the location and tabulation of nebulae. It was perhaps slightly embarrassing to announce himself as the first discoverer of a new comet, particularly if another sighted it before his report appeared in print. Moreover, other men were assuming that function, notably William R. Brooks of the Red House Observatory, as it was called, in near-by Phelps. Brooks discovered eight comets within the next four years, taking over half the prizes awarded by the Warner Observatory.

Although Professor Swift could never outgrow his reputation as Comet Swift, he now fully realized that comets were minor bodies in point of size and mass and of but moderate interest to astronomers. The Earth had passed through the tail of at least one comet with scarcely anyone knowing of or suffering from the experience. Some comets actually may have hit the Earth, doing minor damage. On the other hand, all of the stars which can be seen without the aid of a telescope are more or less comparable to the sun, and belong to the same galaxy or Milky Way System of which our solar system is a part. Far out in space are still other aggregates or clusters of stars, which appear as faint nebulae through a telescope of moderate power, scarcely distinguishable from a comet at first view. Like other comet hunters, Swift had become interested in tabulating these nebulae in order to avoid mistaking one for a comet. Now he decided to make the location and study of these far off star universes his major function.

Dr. Swift, as the press now identified him, proved to be an able cartographer of the heavens. He did not possess the scientific training which was enabling Edward C. Pickering to do pioneer work at Harvard in weighing the stars; nor could he have matched Samuel P. Langley

of Allegheny in his significant studies of stellar radiation, though neither had as powerful a telescope as that in Rochester. On the other hand, Swift's skill as a comet hunter had trained him for patient observation and accurate work with a celestial atlas; now, with excellent equipment, he was able to locate hundreds of new nebulae, island universes never before charted. Most astronomers had assumed that Sir William and Sir John Herschel had between them catalogued practically all of the nebulae in the heavens. Swift, before he finished, added more than 1200 new universes, not a modest achievement, though it did not equal the first crop gathered by the Herschels, father and son.

The Rochester astronomer performed other important functions. Every Tuesday and Friday evening, from eight until ten, the observatory was open to the public. Visitors could gain admittance on other days (except Wednesday and Sunday, reserved for research) by applying first for a twenty-five-cent ticket at Warner's patent medicine establishment on St. Paul Street. It was the first observatory of any size in the world to which the public was welcome, and many entered to enjoy their first close-up view of the heavens. Visitors to the city were invariably driven out to see it; many, over the years, came to Rochester expressly to visit the observatory. In recognition of the public service of the Warner Observatory, the state legislature passed a bill exempting it from taxation.

The bearded, cap-wearing astronomer, who was ever ready to conduct his guests on a tour of the heavens, was still frequently called upon for outside lectures. Thus he explained the "Variations in the Earth's Orbit" at a Teachers' Institute one year, and described the time concepts of astronomers before a group of ministers on another occasion. He not only wrote occasional letters to the local papers but contributed "A Mystery of the Skies" to the *Cosmopolitan* in 1885, several brief articles on comets to the *Sidereal Messenger*, lists of his nebulae and other discoveries to European journals, and in 1887 edited *The History and Work of the Warner Observatory: Rochester, New York, 1883 - 1886*. His most voluminous writing appeared that same year in the form of a series of fifty-two "Simple Lessons in Astronomy," a weekly feature of the *Union & Advertiser*.

It was in the 1880's that Rochester sometimes used the title, "The Astronomical City." Lewis Swift justified it on the basis of the general community interest, manifest by the number of telescopes in the city as well as by the support given his program. William Rebasz had pro-

vided himself with two telescopes, and Henry C. Maine had acquired three, one of them a 12-inch reflector telescope of high power. Reverend Newton M. Mann, the Unitarian minister, and William Streeter, a lock maker, each had good telescopes and devoted much time to the study of astronomy. These and other residents had purchased their lenses from Alvan Clark and Son of Cambridge, who assured Swift in 1888 that they had made more telescopes for Rochester than for any other city in the United States.

Interest in astronomy reached its peak in Rochester during the mid-eighties, beginning to decline towards the close of the decade. The Rochester Academy of Science, organized in 1881, formed an astronomical section which enrolled many of Swift's friends, though for some reason the Professor never joined, possibly because it was primarily for amateurs. By 1888, the astronomical section, as well as most of the ten other sections, had become inactive. When the Academy was re-organized by and for professional scientists a year later, astronomy was not included among its interests. Indeed, Swift, never developed close ties with the university crowd—perhaps his background and his supporters were too worldly for the academicians. In any event, when H. H. Warner's interests turned to other matters, notably to the establishment of the Chamber of Commerce in 1888, activity at the observatory began to fall off. Warner continued to pay Swift's bills, but the comet awards were discontinued. By 1889 the Professor was beginning to complain about the Rochester weather. He was particularly annoyed when a persistent canopy of clouds in September that year obstructed his view of five comets which just then afforded a unique display.

Perhaps, however, it was his recollection of the marvelous new Lick observatory that chiefly depressed the Rochester astronomer. Astronomers throughout the country were eyeing the new institution with interest, tinged with envy, for the \$700,000 endowment left by its founder made even H. H. Warner appear like a piker. Swift had hastened west that March to inspect the new telescope with its 36-inch lens on the top of Mount Hamilton near San Francisco. The vast proportions and ambitious projects of the West Coast, not forgetting the weather, had immensely thrilled him. He was especially interested to learn that Southern Californians were already planning to challenge the supremacy

of the Lick observatory by erecting another of equal or greater power on the more lofty summit of Mount Wilson in the cloudless skies near Los Angeles.

Nobody in Rochester could do much about the weather, except complain, and by 1892 Swift was convinced that it was getting worse. He had been able to find only two cloudless nights without a moon that June, and how, he demanded, could an astronomer work under such conditions. When an offer arrived a month later from the president of Westminster College near Denver, Rochester almost lost its astronomer. Warner apparently checked the move at this time, for the proposal that Swift take the telescope with him to Colorado raised proprietary questions. Instead, the Professor was given a trip west (ostensibly to accept a bronze comet medal awarded him by the newly formed Astronomical Society of the Pacific) with the hope that he would be glad, after a month on the West Coast, to get back to his friends in Rochester.

The aging Professor's restlessness had, nevertheless, a scientific justification. The search for nebulae does require a clear sky and great altitude, neither of which Rochester afforded. Furthermore, the city was experiencing a new surge of growth which entirely surrounded the observatory. A church tower on an adjacent lot was raised to such a height that one section of the heavens was completely blocked off. Improved street lamps, scattered in greater number than before, created a diffuse glow which made it increasingly difficult to detect the faint light of the more distant star clusters. A second glance through the Lick telescope was enough to convince Swift that there were still many uncharted universes to conquer, more than he could ever find in Rochester.

Thus, when H. H. Warner's patent medicine empire tottered about him during the panic of 1893, Professor Swift hastened to accept a call westward. As no one in Rochester was prepared to assume the support of an observatory, no one protested vocally when the telescope was dismounted and packed for shipment, though many were genuinely sorry to see the Professor depart. Some of his friends half expected Swift to return in a few years; meanwhile they could not begrudge him the venture. He certainly had brighter prospects than those which faced many others who were packing their grips in that dark year, H. H. Warner among them.

* * *

Professor Swift had in fact discovered a new star—a personality more vivid and dynamic than Warner in his prime. Professor Thaddeus S. C. Lowe, his new patron, had commenced his colorful career as one of America's first aeronautic experts in the period before the Civil War when balloonists were known, not as navigators, but as professors. He had become the chief aeronautical adviser of the Northern armies during the war, and had continued this interest intermittently in later years, performing with a balloon in Rochester on one occasion. His knowledge of gases enabled him to devise the first American system for the manufacture of artificial ice, which he installed on Gulf steamers, only to suffer bankruptcy during the depression. He invented and built a water-gas apparatus and a new system for manufacturing coke. He finally moved to California in 1891 where the development of a resort area in the Sierra Madre range enlisted his energies. After building a railroad up the Rubio Canyon, scaling Echo Mountain with an inclined railroad, erecting hotels and amusement centers at choice points along the route, he planned to establish an observatory on the top of near-by Mount Wilson, thus overshadowing the Lick observatory to the north and affording an additional attraction for tourists.

Just when Professors Lowe and Swift first met is not clear, nor are the terms of their agreement known, but by the time Swift arrived in 1894, the original scheme had been somewhat modified. Mount Wilson had presented too difficult and costly an ascent and the lesser but more accessible Echo Mountain had been selected. There, 3,500 feet above sea level, and nearly 2,000 feet higher than the Lick observatory, a building was erected in which Professor Swift could mount his telescope and enjoy an unobstructed view of the heavens. The enthusiastic citizens of near-by Pasadena, then in the midst of an early boom, held a reception for the aged astronomer who had twelve comets and 900 nebulae to his credit. A large wooden key to the city was presented to this "Columbus of the Skies," destined, as many hoped, to help place their city on the tourist's map. With his wife and youngest son, Edward, Lewis Swift took up residence at the Echo Mountain House, a quarter-mile from the observatory. Of an evening they could look down on the twinkling lights of Pasadena and Los Angeles, or up at the more lustrous stars of the as yet largely unexplored southern sky.

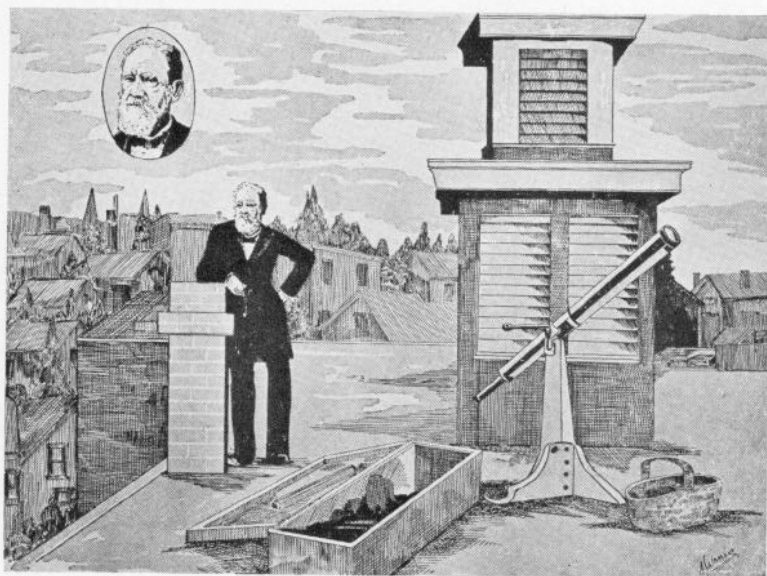
In his seven years at the Lowe observatory, Professor Swift justified the confidence of his scientific friends and the backing of his new promoters. From his lofty perch he was able to identify and catalogue several hundred additional nebulae, increasing his total to 1343. While some of this number have not since been located by other astronomers, more than 1200 of his discoveries in this field have been added to official catalogues; the rest, some tabulated in Rochester, some at Mount Lowe, were possibly faint comets or stars which he mistook for nebulae. His success in spotting comets was not so notable as in earlier years, though he added three to his list. It must have given him a genuine thrill when his son Edward discovered comet IV of 1894.

Perhaps his chief contribution at Mount Lowe was to cultivate the area's budding interest in astronomy. The regularly scheduled demonstration lectures at the observatory during the tourist season never appeared to bore the old man who always enjoyed an audience, especially when it afforded an opportunity to open new vistas to curious visitors. The attraction could not be expected to sustain a railroad, however, and when the tourist business failed to grow as expected, Lowe's venture suffered bankruptcy. For several months in 1895, Professor Swift's salary was cut off, and he enjoyed a trip east, visiting old friends and receiving, while in Rochester, the Jackson gold medal awarded by the Royal Astronomical Society of London for his many contributions to astronomy. Swift was urged at this time to relocate his telescope at the College of Los Angeles, but when the new managers of the railroad decided to resume operations the advantages of his mountain-top vista kept him at Echo Mountain, or Mount Lowe, as it was now most frequently called.

Professor Swift's career as an astronomer was almost ended, for his eyesight was beginning to fail. In 1901, at the age of 81, he finally decided to retire. Already the original plans for the great observatory on the top of Mount Wilson were beginning to materialize, and another three years would see it in operation. His 16-inch telescope would then be devoted solely to popular use, while younger scholars would center their work around the more powerful telescope 3,000 feet further up. Swift was to have no part in this institution, but as he returned east he at least had the satisfaction of knowing that his efforts had helped to pave the way for its establishment.

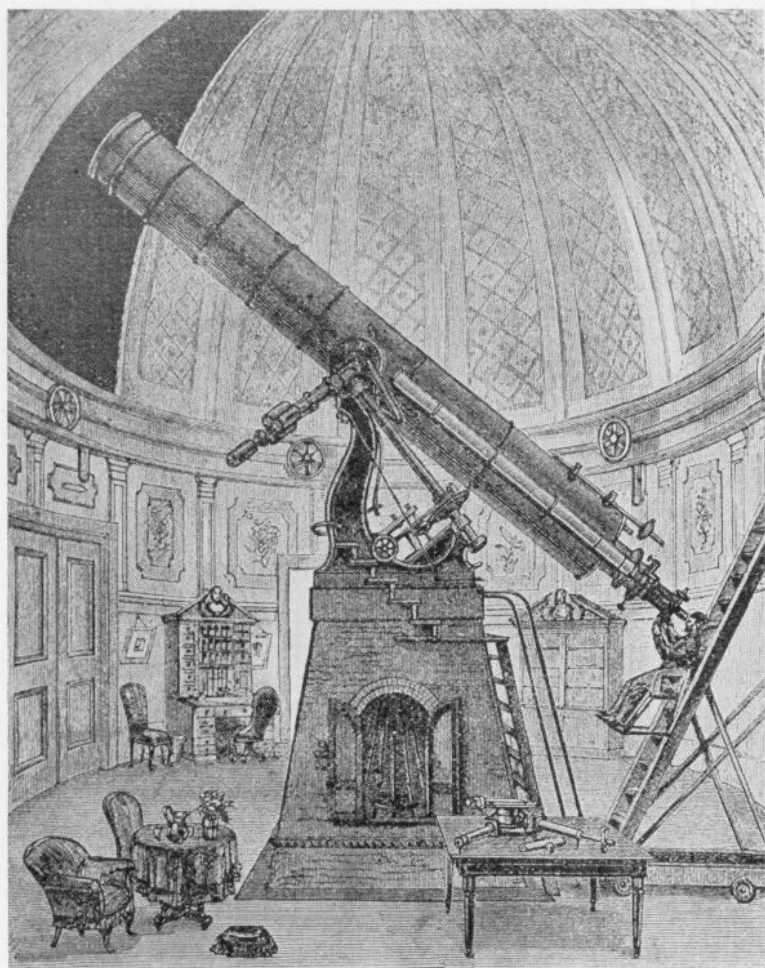
The aged Professor lived on for a dozen more years, most of them spent at his daughter's home in Cortland. The Warner observatory, which he had left in 1893, remained untenanted, a desolate reminder of a dramatic era in Rochester's history. Henry C. Maine, now on the *Union & Advertiser*, retained his old devotion, but most of Swift's other friends had died or left the city. H. H. Warner's mansion was occupied by a newcomer to the avenue, while its former master flitted from city to city in a vain effort to recoup his fortunes. He was back in Rochester briefly in 1911 before retiring to an obscure old age in Minnesota. Thaddeus S. C. Lowe died amidst moderate circumstances at Pasadena in 1913, the same year that Lewis Swift passed away in Cortland.

Professor Swift is not forgotten in Rochester, although his observatory has long since disappeared, but he will be remembered longest by astronomers and amateurs throughout the world who take an interest in comets. The frequent return of his 1880 comet, and the more widely spaced appearances of several other periodic visitors bearing Swift's name, assure him a place on the astronomer's calendar. Like Columbus, he failed to learn much about the character of the objects he discovered, especially the star universes, and he never realized the vast proportions of the map he was drawing; but there the analogy stops for Swift was by no means the first great explorer of the heavens. Yet he had opened new vistas for many, both in Rochester and in the Far West, and the merits of his contributions are enduring.



LEWIS SWIFT ON THE ROOF OF DUFFY'S CIDER MILL

This photograph taken on July 4, 1880, was used in an article on Professor Swift in the *Union & Advertiser*, August 13, 1892. Our reproduction is made from a later broadside of that article.



THE WARNER OBSERVATORY

Reproduced from *Rochester Illustrated* (New York, Alliance Publishing and Engraving Co., 1891), p. 115.



THE WARNER OBSERVATORY

This view, looking east on East Avenue, is reproduced from the frontispiece of *The History and Work of the Warner Observatory* (Rochester, 1887).